SNS Vacuum Instruments

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Presentation Overview

- SNS vacuum instrument quantities

- Description of RHIC pumps and gauges

- Sector valve control and other system functions

- Remote monitoring and control

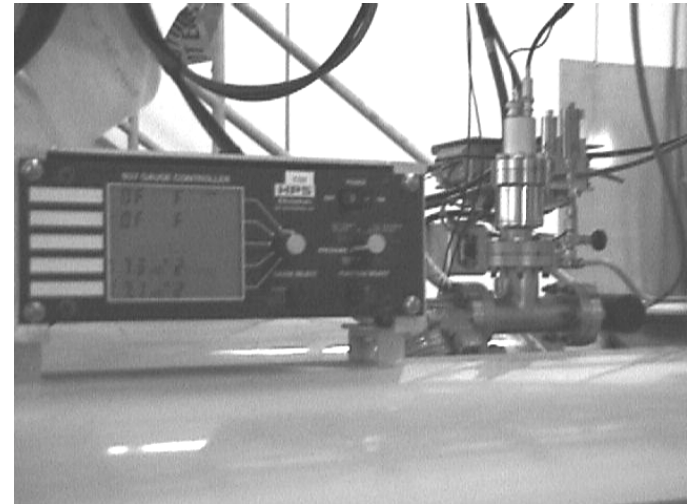- Current status

Summary of Vacuum Instruments

	SV	CC	TC	GC	IP	IPC	TMPs	RGAs
HEBT	5	11	6	6	20	10	5	0
RING	8	16	16	8	42	21	8	8
RTBT	4	10	6	5	12	6	2	1
TOTAL	17	37	28	19	74	37	15	9

Cold Cathode (CC) Gauges

- Inverted Magnetron type.

- Operate between 1×10^{-11} and 1×10^{-3} Torr.

- Bakeable to 350° C.

- RHIC - used same CC used in warm, cold and cryostat spaces.
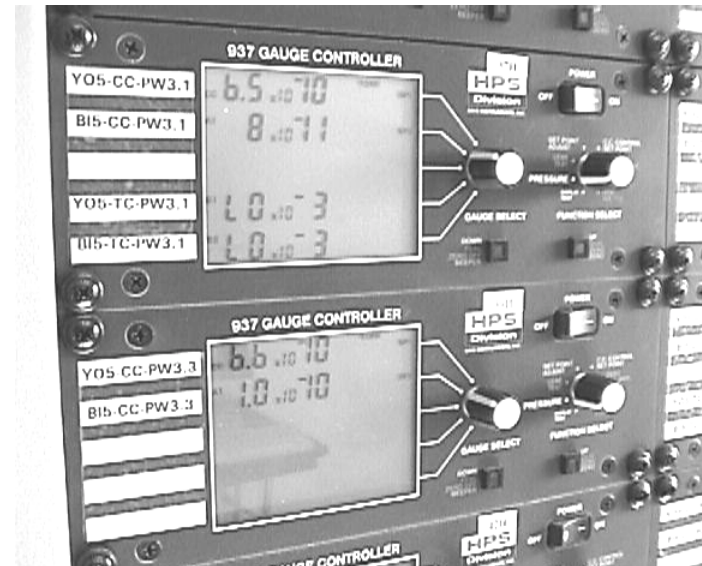
Thermal Conductivity (TC) Gauges

- Convection-enhanced Pirani type.

- Operate between 1×10^{-3} and 1000 Torr.

- Also bakeable to 350° C.

- Again same TC used in all RHIC vacuum spaces, including turbo stations.
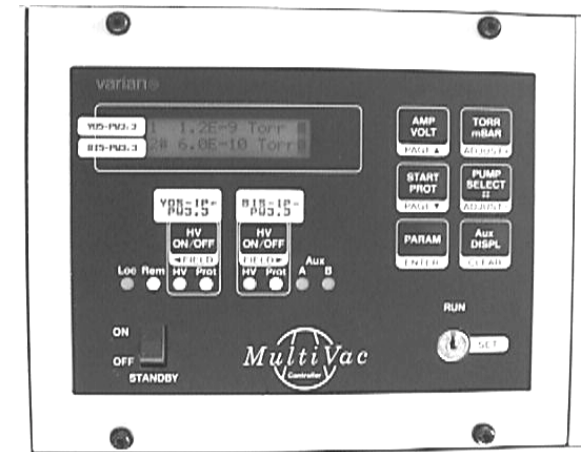
Gauge Controllers

- RS-485 ASCII protocol - fast and simple.

- Controls up to 5 gauges, one must be CC.

- One set point relay per gauge.

- Displays all gauges simultaneously.
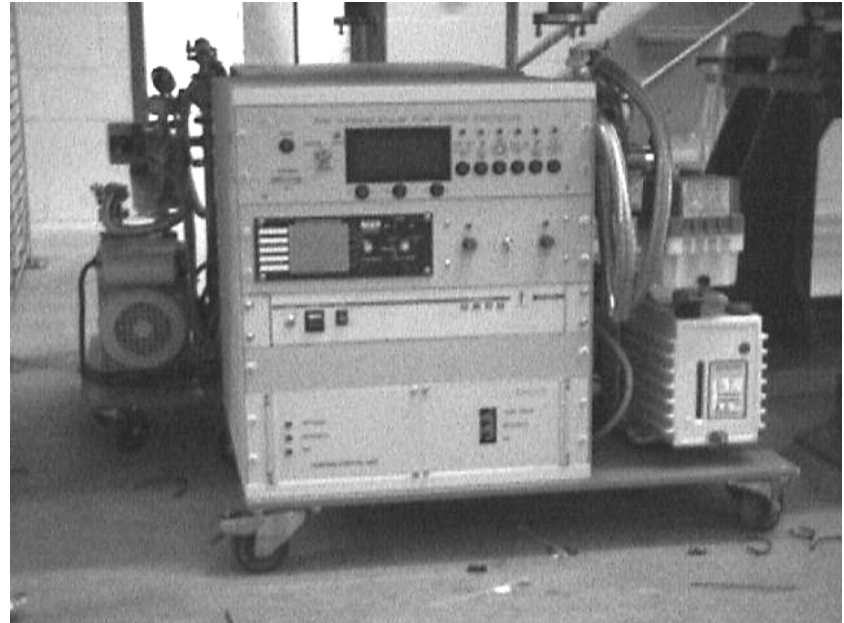
Ion Pump Controllers

- Dual, switching power supplies.

- Operate two pumps independently.

- Pumps operate at 5 kV dc.

- 8-bit RS-485 protocol.

- Up to 2 set points per ion pump.

Turbo molecular pump stations

- Single-board computer-based.

- RS-485 remote communication.

- Incorporate turbo controller, gauge controller.

- Self-protecting.

Residual Gas Analyzers

- Mass range 100 amu.

- RS-485 9-bit binary protocol.

- Collect table-style data for 2, 4, 18, 28, 32, 41 amu.

- Electronics mounted on sensor.

Sector Valve Control

- Programmable Logic Controller (PLC) distributed control.

    - Networked PLCs.

    - Vote to close: two of three gauge/pump set points violated.

    - Open interlock: TC gauge set point violated.

Other PLC Functions

- Control valves through Processor - hard-wired I/O.

- Control & monitor devices via co-processor RS-485 ports.

- Provide beam inhibit and permit signals.

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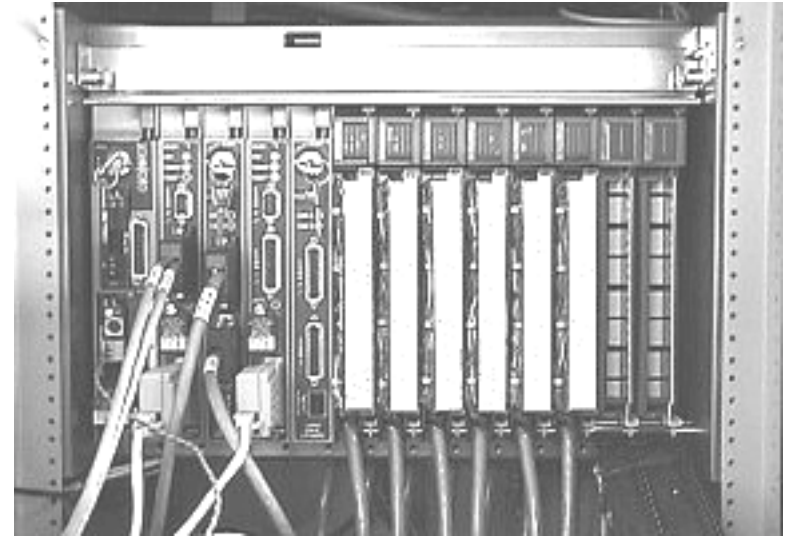
Typical Valve Interlock

| Open	Down-stream Vote			Valve	Up-stream Vote			Open
HTC	HCCA	HCCB	HIP	SV1	CC1A	CC1B	IP1	TC1
TC1	CC1A	CC1B	IP1	SV2	CC2A	CC2B	IP2	TC2
TC2	CC2A	CC2B	IP2	SV3	CC3A	CC3B	IP3	TC3
TC3	CC3A	CC3B	IP3	SV4	CC4A	CC4B	IP4	TC4
TC4	CC4A	CC4B	IP4	SV5	CC5A	CC5B	IP5	TC5
TC5	CC5A	CC5B	IP5	SV6	CC6A	CC6B	IP6	TC6
TC6	CC6A	CC6B	IP6	SV7	CC7A	CC7B	IP7	TC7
TC7	CC7A	CC7B	IP7	SV8	RCCA	RCCB	RIP8	RTC

Vacuum Instrument Control

- Distributed control of pumps & gauges.

- PLC Network spans machine.

- One PLC per support building.
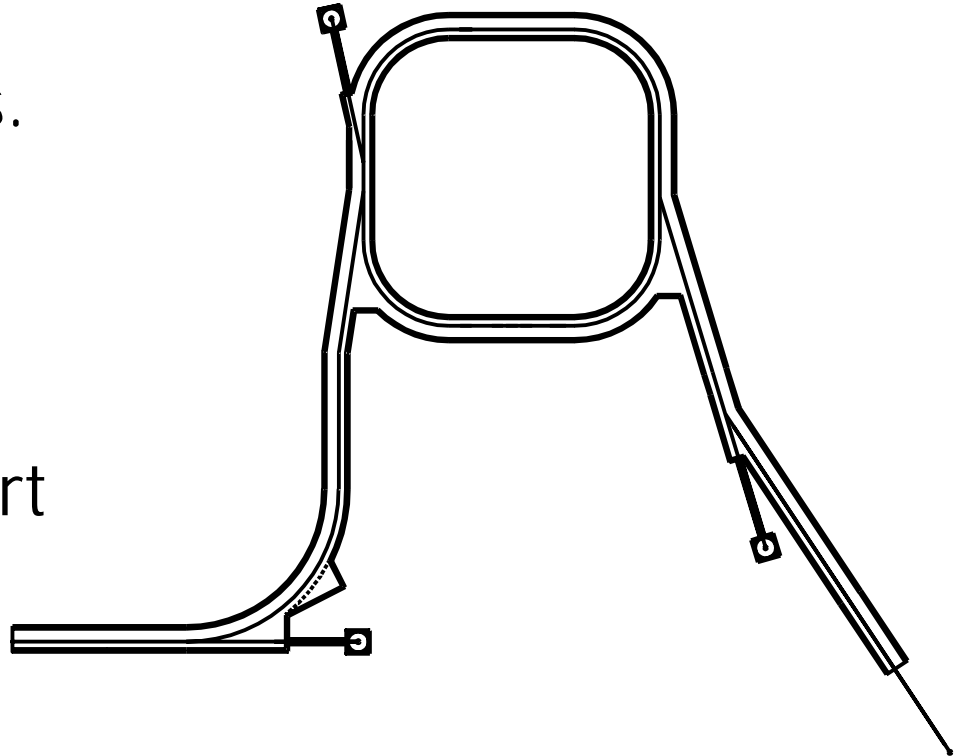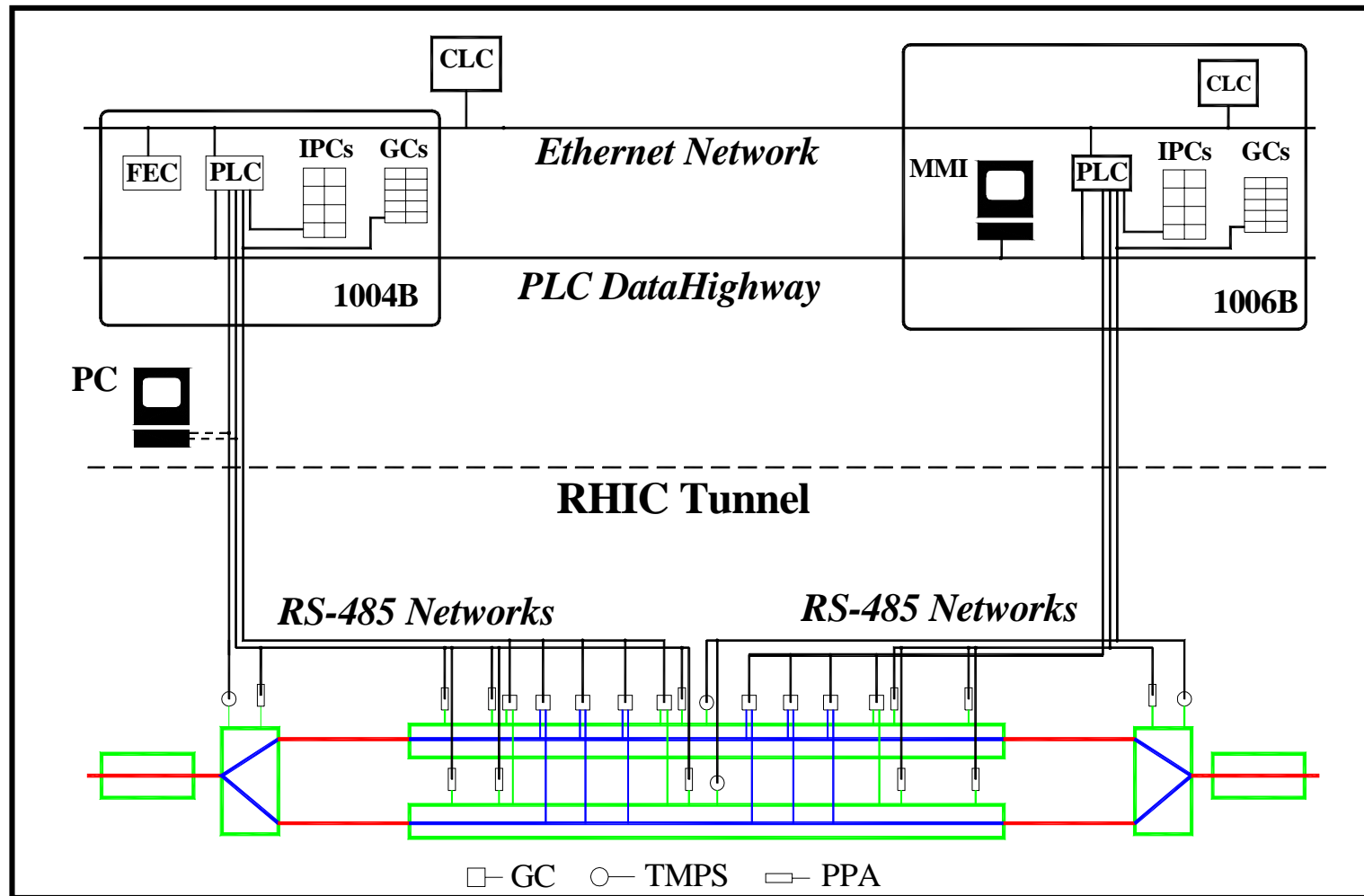
RHIC Vacuum PLC Interfaces
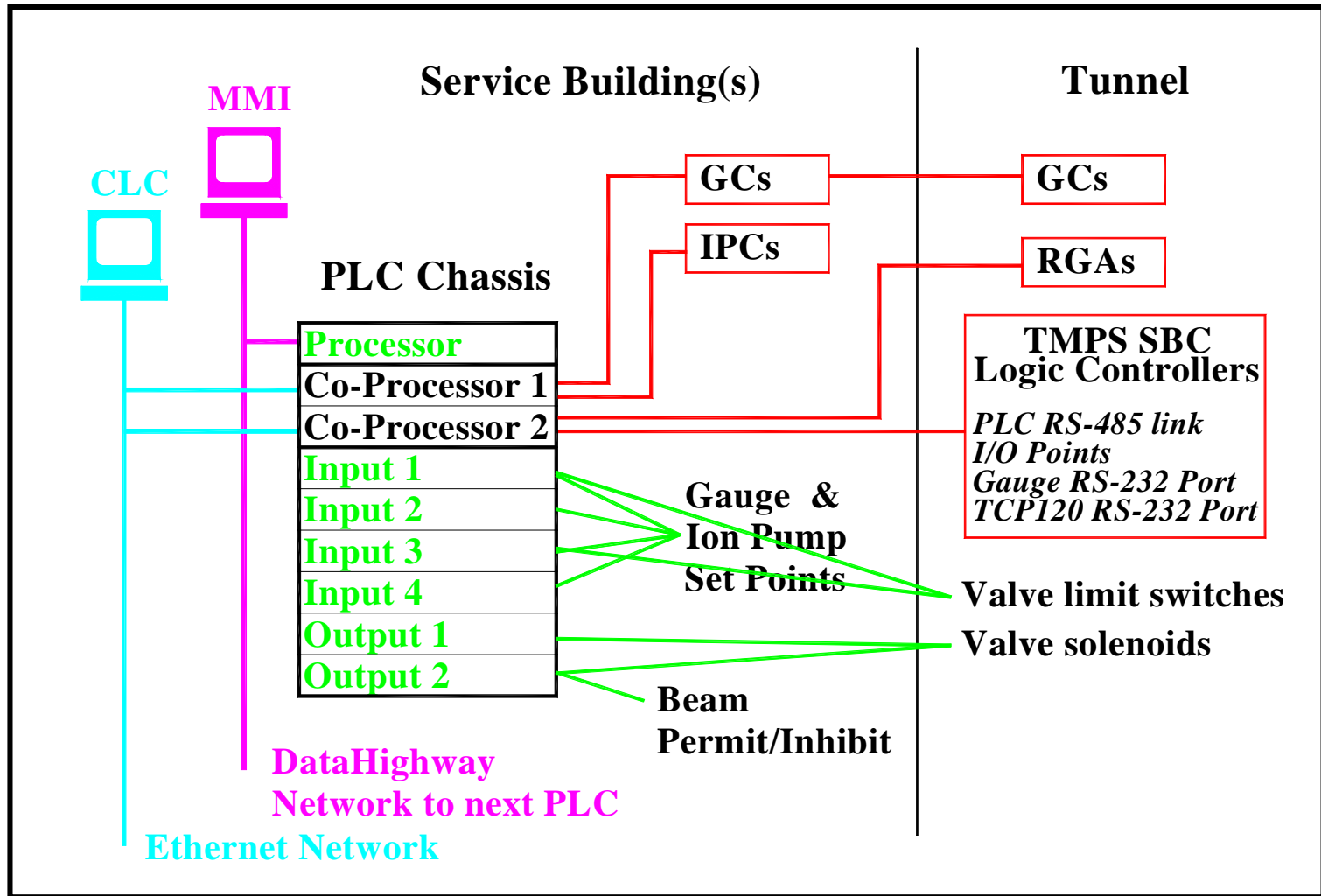
Remote Monitoring & Control

- Controls System front-end computer (fec) and Vacuum System PLC co-processor on Ethernet network.

  – All instrument serial data.

  – Processor data accessed through co-processor.

- PC-Man-Machine Interface (MMI)

  – Two locations.

  – Processor data only.

RHIC Vacuum Control Networks

User Interfaces

- Control System User Interface

  - UNIX workstation applications - pet, LogView, VacuumDisplay.

  - Status and control of gauges, pumps, RGAs, TMPS, and valves.

- Vacuum System User Interface

  - PC-based graphical user interface.

  - Valve status and control, set point status.

SNS Vacuum I&C Issues

- Radiation environment concerns

  - Booster RGAs with remote electronics this summer.

- Standardization issue

  - Naming conventions.

SNS Vacuum I&C Status

- Preliminary device count.

- Power, heat load, and cable tray estimates.

- Procurement effort starting '01
  - Specifications and SOW - 2Q, 3Q.

  - Contract evaluation and award.

  - QA inspection, acceptance test.

  - Installation and final checkout at ORNL.